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(54) **Laundry or dish-washing machine**

(57) In a laundry or dish-washing machine, a thermostat compares the temperature of the washing liquid with at least two control temperatures which can be selected by the user independently of one another. The change of state of the thermostat output controls the advance of the washing machine programmer when the washing liquid has reached the lowest of the control temperatures. This allows the user to set a different washing temperature from that determined by the programmer. In one embodiment, Figure 2, a temperature transducer Rt immersed in the washing liquid comprises a resistor with a negative temperature coefficient and is included in a resistor bridge connected across a constant voltage source U. The transducer Rt supplies a voltage Vt which decreases as the liquid temperature increases. The thermostat comprises two voltage comparators IC1 and IC2 which each at their non-inverting inputs receive the voltage Vt and at their respective inverting inputs two control voltages VC1, VC2 which vary in inverse proportion to the two selected control temperatures. The outputs of the comparators IC1 and IC2 are interconnected and their output signal (voltage VS) controls the advance of the programmer when the voltage Vt reaches the value of the higher of the two voltages VC1, VC2.

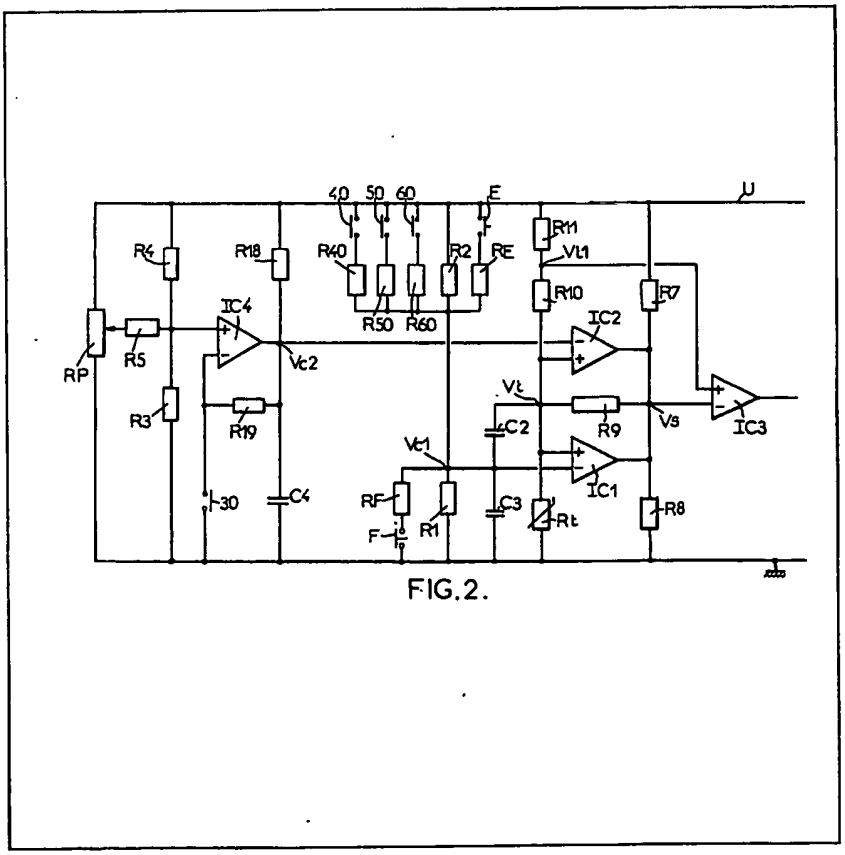

FIG.2.

GB 2 047 752 A

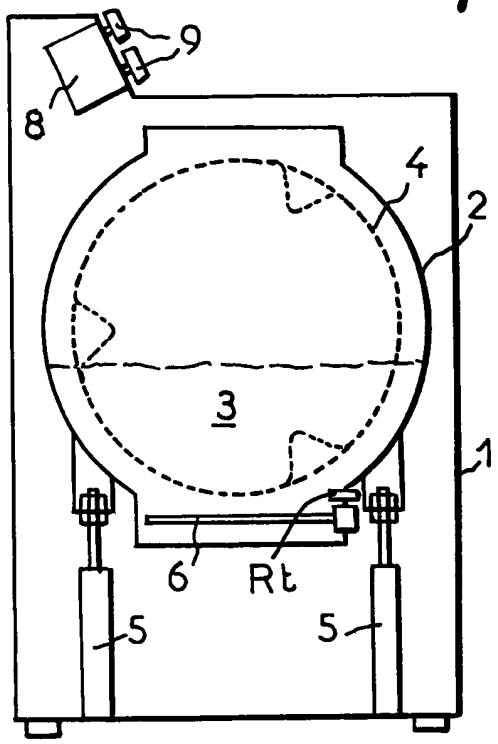

FIG.1.

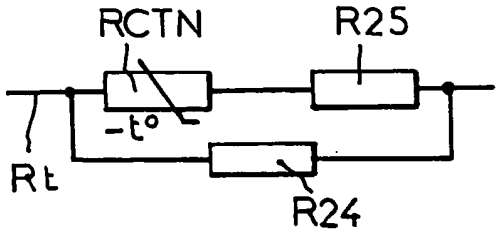

FIG.3.

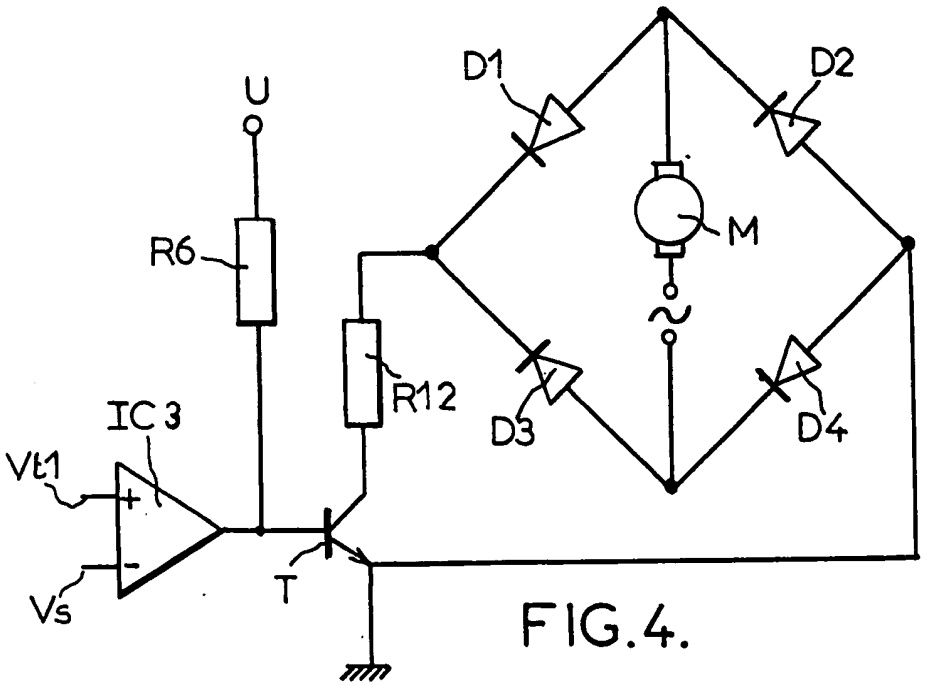

FIG.4.

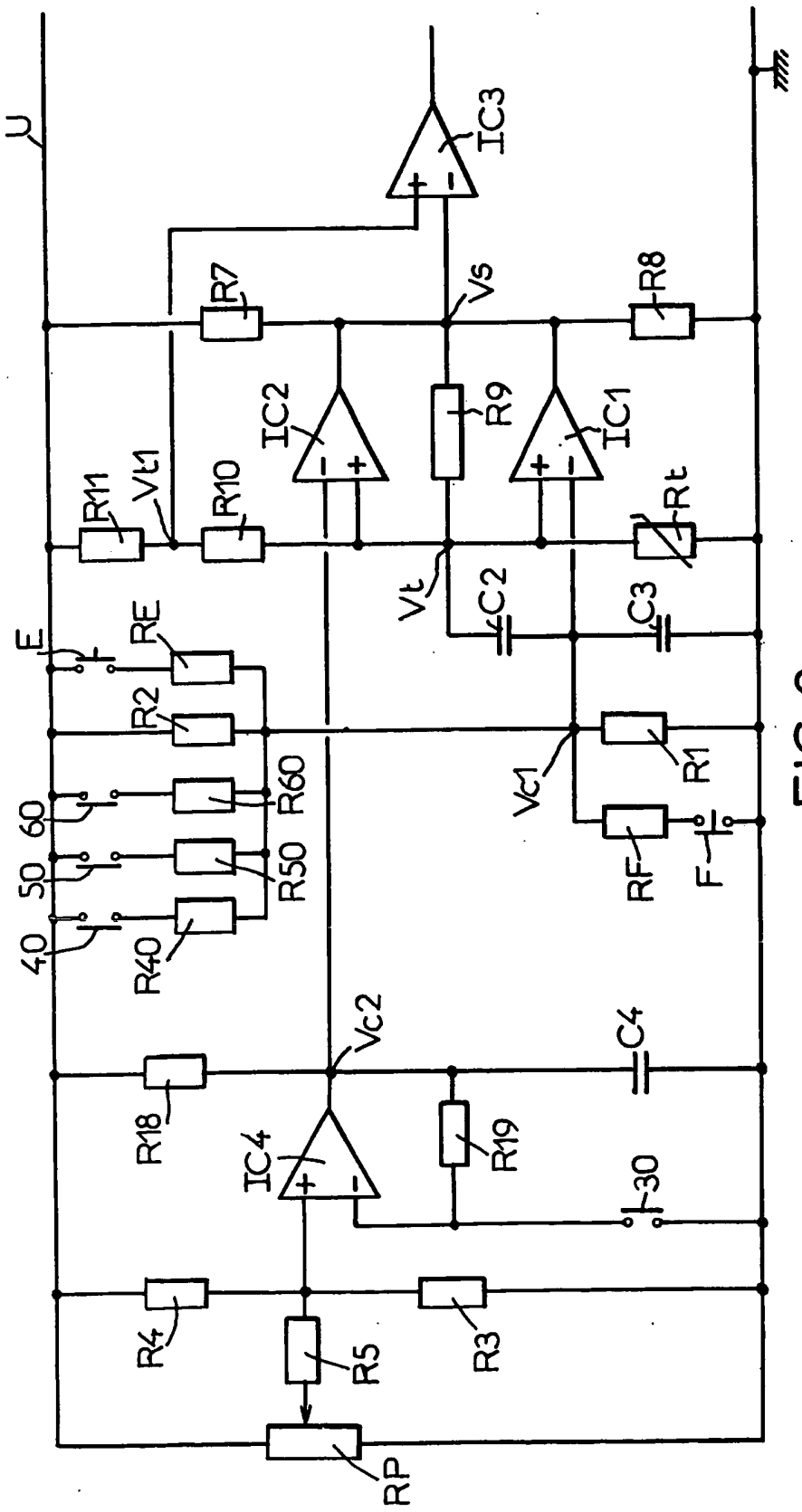
U
IC3
R7
Vs
R8
IC2
R9
IC1
R11
Vt1
R10
Rt
Vt
C2
C3
E
RE
R2
R60
R50
R40
60
50
40
Vc1
R1
RF
F
Vc2
C4
R18
IC4
R19
30
R4
R5
R3
RP

FIG.2.

SPECIFICATION

Laundry or dish-washing machine

The invention relates to a laundry or dish-washing machine, comprising:

- a tub which is adapted to contain the washing liquid,
- heating means for the washing liquid,
- a temperature transducer immersed in the liquid,
- a control-temperature selector,
- a programmer which as it advances controls the sequential progress of the washing cycles, the heating means being rendered operative for at least one of the programmer position,
- a thermostatic device controlling the advance of the programmer when the washing liquid has reached the control temperature, thereby terminating the heating cycle of the washing programme.

Such a washing machine is known from the French Patent Application published under no. 2,360,124. By means of the thermostatic device of this machine the temperature of the washing liquid can be compared with a single control temperature, which is generally determined by the programmer. It has been found that users of a washing machine sometimes wish to select a control temperature which does not correspond to the washing programme they have selected by setting the programmer to a specific starting position. In that case the thermostatic device should allow for this change required by the user.

The washing machine in accordance with the invention is characterized in that the thermostatic device compares the temperature detected by the transducer with at least two control temperatures that can be selected independently of each other, the change of state of the output of said thermostatic device causing the programmer to advance when the washing liquid has reached the lowest control temperature.

The machine in accordance with the invention accepts changes in control temperature when it concerns a temperature reduction, but rejects them if the user wishes to raise the washing temperature in comparison with that dictated by the selected programme. Thus, the user can intervene only when there is no risk that the items to be washed will be damaged by inadvertent overheating.

In a preferred embodiment of the invention:

- the temperature transducer comprises a resistor with a negative temperature coefficient and is included in a resistor bridge which is connected across a constant-voltage source, said transducer supplying a voltage (Vt) which decreases as the temperature of the liquid increases,
- the thermostatic device comprises two voltage comparators (IC1 and IC2) which each at their non-inverting inputs, receive the voltage (Vt) supplied by the temperature transducer and at their respective inverting inputs two control voltages (Vc1, Vc2) which vary in inverse proportion to the two control temperatures,
- the outputs of the two comparators (IC1 and IC2) are interconnected and the electric signal which they supply controls the advance of the programmer when the voltage (Vt) from the transducer reaches the value of the higher of the control voltage (Vc1 or Vc2).

In order to ensure a high degree of safety of the washing machine in accordance with the invention, the outputs of the two comparators (IC1 and IC2) of the thermostatic device in a special embodiment, are connected to the centre point of a bridge of two resistors connected in series across the constant-voltage source, and are also connected to the inverting input of a third voltage comparator (IC3), which at its non-inverting input receives a voltage which is maintained higher than the voltage (Vt) supplied by the temperature transducer, the output of said third comparator (IC3) controlling the advance of the programmer. Thus, in the event of a defect in the temperature transducer circuitry, which defect in most cases manifests itself as a short-circuit or an interruption of the transducer, the third voltage comparator (IC3) will receive a signal at its non-inverting input, which signal is always greater than that which it receives at its inverting input. In the two failure cases the serial combination of the changes of state of the comparators (IC1 or IC2) and IC2 controls the advance of the programmer, thereby discontinuing the heating cycle of the washing programme.

In a special embodiment of the machine in accordance with the invention, the outputs of the two first comparators (IC1 and IC2) are connected to their non-inverting inputs *via* a resistor, thus providing feedback from said outputs to said inputs in order to ensure that when the liquid has reached a control temperature the change of state of the thermostatic device can only be reversed with hysteresis. This arrangement prevents re-starting of the heating cycle of the washing liquid when, immediately after the liquid has reached the control temperature, the programmer has advanced, either automatically or owing to the intervention of the user, to a portion which again demands a "heating" cycle in the programme.

Since the thermostatic device used operates as a voltage comparator, the manner in which the control voltages are generated is irrelevant. These voltages may for example be obtained by connecting voltage dividers to the source, which connection may be controlled by the user of the machine or by the programmer. In a special embodiment of the machine in accordance with the invention the first control voltage (Vc1) is supplied by a bridge of two resistors (R1 and R2) connected in series across the constant-voltage source, whilst additional resistors can be connected in parallel with each of the two bridge resistors. (R1 and R2) by means of electrical contacts controlled by the programmer or by the user of the machine for selection of the first control temperature. This embodiment has the advantage of greater safety:

indeed, if the electrical contacts by means of which an additional resistor is to be included are defective, the bridge (R1, R2) remains connected and owing to the design the voltage supplied by said bridge, will correspond to a control temperature which is not dangerous for the machine, for example 90°C, even if in the case of a defect the temperature desired by the user (30°, or 40°, or 50°, ... etc.) is not reached. The electrical contacts associated with the programmer may be electromechanical contacts or electronic switches, depending on the type of programmer.

Another embodiment of the machine in accordance with the invention is characterized in that the second control voltage (Vc2) is supplied by a bridge of two resistors (R3 and R4) connected in series across the constant-voltage source, the voltage thus obtained being modified by the voltage available on the wiper of a potentiometer which is also connected to the constant-voltage source, which potentiometer can be operated by the user of the machine for selecting the second control temperature. The advantage of this embodiment resides in the same safety aspects as set forth in the preceding paragraph, whilst furthermore the risk of a defect as a result of an interruption is greater in the case of a manually operated potentiometer than in the case of electromechanical or electronic contacts incorporated in the programmer.

In a special embodiment of the invention, said second control voltage (Vc2) is applied to the thermostatic device by means of an operational amplifier connected as a voltage follower, whilst furthermore the inverting input of said amplifier may be connected to a zero-voltage point in order to maintain the output voltage of said amplifier at a value which is independent of the voltage supplied by the bridge (R3 and R4) and the associated potentiometer. This possibility of ignoring the control temperature set by the user of the machine is for example utilized during the "prewash" cycle of the programme when this cycle is required. Indeed, in most cases prewashing is effected at a low temperature (for example 30°C), regardless of the temperature selected for the actual washing operation.

The change of state of the output of the thermostatic device used in accordance with the invention controls the advance of the programmer of the machine. This programmer may be electromechanical or a fully electronic device. The use of an electromechanical programmer driven by a synchronous micromotor which is connected to the electric mains is described by the previously cited French Patent Application no. 2,360,124. The machine in accordance with this special embodiment is characterized in that the output voltage of the thermostatic device is applied to the base of a transistor which, when it is conductive, short-circuits a bridge of four diodes connected in series with the a.c. supply of the micromotor. Certain electromechanical programmers are equipped with a coil which controls the engagement and disengagement of a part of their programming cams, in order to interrupt the washing sequence when the washing liquid is being heated. The thermostatic device in accordance with the invention then controls the state of said coil.

The programmer of the machine may be of the type with low-voltage sliding contacts, its advance being controlled by an electronic time-base. Finally, it may be provided with a fully electronic logic system, the electric command signals being transferred to the elements of the machine *via* amplifier circuits (buffers). In these two last-mentioned cases, the thermostatic device in accordance with the invention starts or stops the electronic time base controlling the programmer directly from the output of the comparator IC3.

Embodiments of a washing machine in accordance with the invention will be described in more detail with reference to the drawings.

Figure 1 is a cross-sectional view of a laudry washing machine.

Figure 2 is the diagram of a thermostatic device with which the machine in accordance with the invention is equipped.

Figure 3 is an example of a temperature transducer arrangement.

Figure 4 shows an example of a circuit controlling the advance of the programmer on a machine in accordance with the invention.

Figure 1 shows a schematic cross-sectional view of a laundry washing machine 1 in which the tub 2 contains the washing liquid 3.

The interior of the tub accommodates a rotary cylindrical perforated drum, which is adapted to contain and stir the laundry to be washed. The tub 2 bears on the base of the machine *via* elastic shock-absorber limbs 5. At the bottom of the tub 2 there are disposed an electric heating element 6 and a temperature transducer Rt, both elements being immersed in the washing liquid.

The washing machine is controlled by a programmer 8, the washing programme being selected by the user of the machine by means of control buttons 9. Once selection has been effected and the user has started the washing programme, the progress of programme and thus the actuation of the various elements of the machine are obtained by the advance of the programmer. These elements are specifically the motor driving the washing drum, the washing water inlet valves, the pump for draining the tub and the heating element 6, which in this case is constituted by a resistor to which an electric current flows. The temperature transducer Rt is electrically connected to the programmer 8 *via* a thermostatic device, which causes the programmer to advance when during a "heating" cycle of the programme the temperature of the washing liquid reaches the control temperature, which is determined either by the selected programme or by the actuation of one of the control buttons 9.

Figure 2 shows an embodiment of a thermostatic device with which a laundry washing machine in accordance with the invention is equipped. The thermostatic device is constituted by two voltage comparators IC1 and IC2, which are connected to a constant-direct-voltage source U, not shown. These two

comparators have a common non-inverting input at which they receive a voltage Vt supplied by the temperature transducer Rt. In the example of Figure 3 this transducer Rt is constituted by a resistor with a negative temperature coefficient (RCTN) in series with a fixed resistor R25, the combination of the two being shunted by a fixed parallel resistor R24. When the temperature rises, this arrangement enables a decrease of the overall resistance to be obtained which is less rapid than the decrease of the resistance of the NTC resistor. Moreover, in the case of series manufacture, the temperature transducers should have constant characteristics so that they can be interchanged: by adjusting the resistance value of R25 it is possible to correct differences in characteristics among NTC resistor from the same production batch or among NTC resistors obtained from different sources.

In the example of a washing machine shown in Figure 2, the transducer Rt is connected in series with two fixed resistors R10 and R11 across the voltage source U. The voltage V1 is available across the transducer Rt.

Furthermore, at its inverting input the voltage comparator IC1 receives a control voltage Vc1 which is available across a resistor R1, which in conjunction with a resistor R2 constitutes a divider bridge, R1 and R2 being connected in series across the voltage source U. The control voltage Vc1 corresponds to a control temperature Tc1, which by means of IC1 is compared with the temperature of the washing liquid in which the transducer Rt is immersed. The control voltage Vc1 can be changed by the inclusion of one or more resistors in parallel with R1 or R2. For example, by the inclusion of a resistor R60, R50, R40, ... to R2 the control voltage Vc1, and thus the corresponding control temperature, can be reduced. If the voltage Vc1 obtained with solely the resistors R1 and R2 corresponds to a temperature of for example 90°, then the inclusion of R60, R50, R40 .... will respectively enable the control temperature to be reduced to 60, 50, 40°C .... . The additional resistors are included by means of switches 60, 50, 40 ... associated with the programmer, so that depending on the type of programme they may be mechanical or electronic switches. Their closure is controlled by the programme selected by the user. Further resistors may be connected to R1 or R2 *via* a manual switch which can be operated by the user. This may for example be the resistor RE, which is connected in parallel with R2, R60, R50, R40 .... by means of the manual switch E. This resistor Re enables the voltage Vc1 to be increased, *i.e.* by way of economy, the control temperature Tc_1 to be reduced in comparison with the temperature dictated by the choice of the washing programme. It may also be the resistor RF, which is normally connected in parallel with R1 when the manual switch F is closed, in the rest position. By opening the switch F, the user causes the voltage Vc1 to increase and thus the control temperature Tc2 to be reduced. If the resistance of RF is small in comparison with R1, this may result in cancellation of the "heating" cycle (washing control set to "COLD", for example 10°C).

At its inverting input the voltage comparator IC2 receives a second control voltage Vc2 obtained by means of a bridge of two resistors R3, R4, connected in series across the voltage source U. The fixed voltage across R3 is modified by a variable voltage available on the wiper of a potentiometer RP, which is also connected across the voltage source U. The wiper of RP is connected to the centre point of the bride R3, R4 *via* the resistor R5. The variable voltage supplied by this double divider bridge RP, R3, R4 corresponds to a second control temperature Tc2, which by means of IC2 is compared with the temperature of the washing liquid, which is represented by the voltage Vt obtained across the transducer Rt. For reasons which will be explained later, the voltage Vc2 is supplied to the comparator IC2 *via* an operational amplifier IC4, which is normally connected as a voltage follower by connecting its output to its inverting input *via* the resistor R19.

The outputs of the two comparators IC1 and IC2 are interconnected. The output voltages have a polarity determined by a resistor bridge R7, R8 whose resistors are connected in series across the voltage source U. The resulting signal Vs controls the advance of the programmer of the machine and thus discontinues the heating cycle of the washing programme that is in progress.

The operation of the thermostatic device which is described follows directly from its design: the temperature of the washing liquid is simultaneously compared with two control temperatures Tc1 and Tc2. In the cold condition the voltage Vt is a maximum: it decreases as the temperature of the liquid increases. When the voltage Vt is greater than the two control voltages Vc1 and Vc2, *i.e.* when the temperature of the liquid is lower than the two control temperatures Tc1 and Tc2, the outputs of the comparators IC1 and IC2 are in the high state (voltage as a result of the bridge R7, R8). When the temperature of the liquid has reached the lower of the control temperatures, the output of one of the comparators is changed to the low state (out-put voltage zero). The change of state of one of the comparators IC1, IC2 causes the voltage Vs to change. This change is employed in order to control the advance of the programmer of the machine.

Although the voltage Vs may be utilized directly for controlling the programmer, it is to be preferred for reasons of safety to compare it with a voltage Vt1 available between the resistors R10 and R11, which are connected in series with the temperature transducer Rt. The voltages U, Vt and Vt1 are related to each other by the equations:

$$\frac{U}{R10 + R11 + Rt} = \frac{Vt}{Rt} = \frac{Vt1}{R10 + Rt}$$

where R10, R11, Rt represent the resistance values of the corresponding resistors, R7, R8 and R9 being ignored because of the high resistance value of this last-mentioned resistor (see later). R10, R11, Rt, R7 and R8 can be given such resistance values that the change-over to the low level of the output of a comparator

IC1 or IC2 reduces the voltage Vs from a value higher than Vt1 to a value lower than Vt1. In this case the change of the state of IC1 or IC2 results in a change of state of the output of the comparator IC3 from the low level to the high level. This change of the output voltage of IC3 is utilized for controlling the advance of the programmer of the machine.

The safety of the machine thus realized is improved by ensuring that the programmer is also advanced in two failure cases which may occur in the transducer Rt. On the one hand, if the transducer Rt is interrupted, the voltages Vt and Vt1 become substantially equal to U, the outputs of the comparators IC1, IC2 are in the high state (Vs = voltage claimed by means of the bridge R7, R8), but the output of IC3 is also high if, by design, $Vs < Vt1$. On the other hand, if the transducer Rt is short-circuited, the voltage Vt is zero, the output of the comparators IC1 and IC2 is low (Vs minimal), but the output of IC3 will be high if, by design, the minimum value of $Vs<U \times R10/(R10+R11)$. In these two failure cases, the programmer will be advanced, thus avoiding that the programme remains at the "heating" cycle.

In the example of Figure 2, the comparators IC1 and IC2 of the thermostatic device are actuated with hysteresis owing to the presence of the resistor R9 of high value, which connects their output (voltage Vs) to their input (voltage Vt). When the washing liquid is being heated, the outputs of IC1 and IC2 are high, and the resistor R9 enables the voltage Vt to be slightly raised relative to that supplied by the resistor bridge Rt, R10, R11. When Vt becomes equal to the higher of the control voltages Vc1 or Vc2, the state of one of the comparators changes and the voltage Vs drops. Thus, the presence of R9 provides a slight decrease of Vt relative to the actuating value. This arrangement is particularly useful if the programmer of the washing machine comprises several consecutive "heating" positions in spite of this there will be no new heating cycle if the washing liquid has reached the required temperature.

It has already been mentioned that in the example described the second control voltage Vc2 is transferred to the comparator IC2 *via* an operational amplifier IC4 which is normally connected as a voltage follower. The variable voltage obtained from the bridge R3, R4 and the potentiometer RP is applied to the non-inverting input of IC4, the output and the inverting input of IC4 being interconnected by means of a resistor R19. Furthermore, the output of IC4 is biassed by a resistor R18 which connects it to the potential U. By connecting the inverting input of IC4 to earth by means of the switch 30, this arrangement enables a preferred control voltage to be established, whose value is given by R18 and R19 and which takes the place of the control voltage normally obtained from the potentiometer circuit R3, R4, RP. The switch 30 is for example associated with the programmer of the machine and will be actuated during the heating cycle of a "prewash" programme, which in certain cases precedes the laundry washing operation. Such a "prewash" is generally effected at a comparatively low temperature, for example 30°C, regardless of the temperature selected for the actual washing programme (30, 40, 50 .... 90°C).

Figure 4 gives an example of a circuit which enables the output of the thermostatic device to be utilized for controlling the advance of a programmer of a washing machine in accordance with the invention. In this case the programmer is of the electromechanical type, a synchronous electric motor M powered by the a.c. mains serving to drive cams which are adapted to open or close switches such as those shown in Figure 2 (contacts 30, 40, 50, 60) as well as the power-supply contacts for the heating resistor 6 of the washing liquid (Figure 1).

The output of the comparator IC3, which is biassed by means of a resistor R6 relative to the potential U, is connected to the base of a transistor T whose collector-emitter circuit, in series with a load resistor R12, constitutes a diagonal of a diode bridge D1, D2, D3, D4. The other diagonal of the bridge D1-D4 includes the motor M in series with the alternating voltage source (mains) with which it is powered. Furthermore, the emitter of the transistor T is connected to earth.

This output circuit operates as follows: when the output of IC3 is in the high state, transistor T is conductive and, *via* resistor R12, short-circuits the bridge D1-D4: the motor M is energized. When the output of IC3 is low, transistor T is cut off and the motor M is not energized, the leakage current of T being insufficient.

When the programmer reaches the "heating" cycle of the washing programme, *i.e.* when the motor M has closed the contact for energizing the heating, the thermostatic device will block this motor until one of the control temperatures is reached (comparator IC3 low). As soon as the liquid reaches the lower of the control temperatures, the motor M is energized (comparator IC3 high) and the heating contact is opened.

By way of example, the following list is given of components used for realizing the circuits shown in Figures 2, 3 and 4, assuming that the potential U is + 10 V. Figure 2:

- IC1, IC2, IC3, IC4 belong to an integrated circuit with four voltage comparators of the type LM 339 (SIGNETICS).

R1	= 121	kOhms	R11	= 52.3	kOhms
R2	= 54.9	kOhms	R18	= 33.2	kOhms
R3	= 33.2	kOhms	R19	= 39.2	kOhms
R4	= 121	kOhms	R40	= 11.5	kOhms
R5	= 37.4	kOhms	R50	= 18.2	kOhms
R7	= 33.2	kOhms	R60	= 30.9	kOhms
R8	= 110	kOhms	RE	= 30.9	kOhms
R9	= 374	kOhms	RF	= 8.45	kOhms
R10	= 5.36	kOhms	RP	= potentiometer 47 kOhms	

Furthermore, smoothing capacitors should be connected to the inputs of comparators IC1 and IC2 in order to protect them against spurious signals:

C3 = 3.3µF and C4 = 10µF between earth and the inverting input of IC1 and IC2 respectively.
C2 = 1µF between the two inputs of IC1.

Figure 3:

RCTN	=	100 kOhms at 25°C, NTC-resistor.
R24	=	kOhms
R25	=	330 ohms.

Figure 4:

D1, D2, D3, D4 diodes type 1 N 4007

T	=	NPN transistor ED 232
R6	=	10 kOhms
R12	=	4.7 kOhms, 0.5 W.

CLAIMS

1. A laundry or dish-washing machine, comprising:
   - a tub which is adapted to contain the washing liquid,
   - heating means for the washing liquid,
   - a temperature transducer immersed in the liquid,
   - a control-temperature selector,
   - a programmer which as it advances controls the sequential progress of the washing cycles, the heating means being rendered operative for at least one of the programmer positions,
   - a thermostatic device controlling the advance of the programmer when the washing liquid has reached the control temperature, thereby terminating the heating cycle of the washing programme,

characterized in that the thermostatic device compares the temperature detected by the transducer with at least two control temperatures that can be selected independently of each other, the change of state of the output of said thermostatic device causing the programmer to advance when the washing liquid has reached the lowest control temperature.

2. A washing machine as claimed in Claim 1, characterized in that:
   - the temperature transducer comprises a resistor with a negative temperature coefficient and is included in a resistor bridge which is connected across a constant-voltage source, said transducer supply a

voltage which decreases as the temperature of the liquid increases,

- the thermostatic device comprises two voltage comparators which each at their non inverting inputs receive the voltage supplies by the temperature transducer and at their respective inverting inputs two control voltages which vary in inverse proportion to the two control temperatures,
- the outputs of the two comparators are interconnected and the electric signal which they supply controls the advance of the programmer when the voltage from the transducer reaches the value of the higher of the control voltages.

3. A washing machine as claimed in Claim 2, characterized in that the outputs of the two comparators of the thermostatic device are connected to the centre point of a bridge of two resistors connected in series across the constant-voltage source, and are also connected to the inverting input of a third voltage comparator which at its non-inverting input receives a voltage which is maintained higher than the voltage supplied by the temperature transducer, the output of said third comparator controlling the advance of the programmer.

4. A washing machine as claimed in anyone of the Claims 2 or 3, characterized in that the outputs of the two first comparators are connected to their non-inverting inputs *via* a resistor, thus providing feed-back from said outputs to said inputs in order to ensure that when the liquid has reached a control temperature the change of state of the thermostatic device can only be reversed with hysteresis.

5. A washing machine as claimed in any of the Claims 2 to 4, characterized in that the first control voltage is supplied by a bridge of two resistors connected in series across the constant-voltage source, whilst additional resistors can be included in parallel with each of the two bridge resistors by means of electrical contacts controlled by the programmer or by the user of the machine, for selection of the first control temperature.

6. A washing machine as claimed in any of the Claims 2 to 5, characterized in that the second control voltage is supplied by a bridge of two resistors connected in series across the constant-voltage source, the voltage thus obtained being modified by the voltage available on the wiper of a potentiometer which is also connected to the constant-voltage source, which potentiometer can be operated by the user of the machine for selecting the second control temperature.

7. A washing machine as claimed in any of the Claims 2 to 6, characterized in that the second control voltage is applied to a thermostatic device by means of an operational amplifier connected as a voltage follower, whilst furthermore the inverting input of said amplifier may be connected to a zero-voltage point in order to maintain the output voltage of said amplifier at a value which is independent of the voltage supplied by the bridge and the associated potentiometer.

8. A washing machine as claimed in any of Claims 1 to 7, characterized in that the output of the thermostatic device is applied to the base of a transistor which, when it is conductive, short-circuits a bridge of four diodes connected in series with the a.c. supply of a micromotor which is adapted to drive the programmer of the machine.

9. A washing machine as claimed in any of the Claims 1 to 7, characterized in that the output of the thermostatic device starts or stops an electronic time-base which controls the advance of the programmer.

10. A laundry or dish-washing machine substantially as hereinbefore described with reference to any one of the accompanying drawings.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/053402

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G05D23/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 198 957 A (CAGE, JOHN M ET AL) 22 April 1980 (1980-04-22) column 2, line 13 - column 4, line 16; figure 1	1-3,5, 8-12
X	EP 0 579 947 A (ZANUSSI ELETTRODOMESTICI S.P.A) 26 January 1994 (1994-01-26) column 4, line 2 - line 54; figure 2	12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance
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16 March 2005	29/03/2005

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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